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SCIENTIFIC WORKERS IN THE FOOD MANUFACTURING INDUSTRIES 1/

A dramatic factor that has contributed to the growth in output per man-hour in the factory processing of farm food products is new technology. But to achieve these technological changes, food processing companies added numerous technicians and scientific workers to the labor force.

Since World War II, production workers in the food processing industry have been declining in number, whereas the number of other-than-production workers has been increasing. 2/ This change in composition of the labor force is partly explained by technological changes. The classification "other-than-production workers" includes employees who perform administrative, professional, clerical, and sales jobs, as well as those performing scientific and engineering activities.

Scientific workers represent a small proportion of employment in the food processing industry, but their wages and

salaries are among the highest in the industry. They include chemists, engineers, mathematicians, agricultural scientists and biological and other scientists. The greatest increase in employment of these workers occurred between 1954 and 1957; there was little change between 1957 and 1959.

This article is based on surveys by the National Science Foundation of employment of scientific workers and outlays for research and development by American industries. These data relate only to establishments specializing in the manufacture of food and kindred products. Not included in this article is employment in research and development activities that may contribute to the technological advance of the food processing industry undertaken by the chemical industry, the machinery products industry, the electrical equipment industries, universities, independent commercial laboratories, engineering service firms, trade associations, or Government agencies.

Employment

About 15,400 scientists and technicians were employed by food and kindred products manufacturing companies in 1959; of these 4,100 were engineers (table 11).

About half of the scientists, including engineers, performed functions connected with production and operations. 3/ The next largest group was employed in re-

1/ Prepared by Imogene Bright, agricultural economist, Marketing Economics Division, Economic Research Service.

2/ "Changing Composition of Labor Force in Food Manufacturing Industry," Imogene Bright, The Marketing and Transportation Situation, July 1957, pp. 16-21.

3/ Production and operations include "work primarily related to the production processes or operations of a company such as inspection, quality control, etc." Included are "design analysis and testing that are not part of research-development." National Science Foundation, Scientific and Technical Personnel in American Industry, 1960, p. 61.

Table 11.--Scientists and technicians classified by occupational group, food and kindred products manufacturing industry, 1959

Occupational group	Number
Scientists:	
Engineers	4,100
Chemists	3,900
Mathematicians	100
Agricultural scientists	1,100
Biological scientists	500
Other scientists	400
	<u>1/10,200</u>
Technicians:	
Draftsmen	800
Engineering and physical science technicians	1,500
Medical, agricultural and biological technicians	1,400
Other technicians	1,500
	<u>5,200</u>
Total	15,400

1/ Items do not add to total because of small number not reported for following groups: Physicists, metallurgists, geologists, and geophysicists.

National Science Foundation, Scientific and Technical Personnel in American Industry, 1960, pp. 28, 43.

Table 12.--Scientists classified by primary function, food and kindred products, industry, 1959

Functions	Number 1/	Percent
Production and operations	5,000	49
Research and development	2,800	28
Management and administration of:		
Research and development	900	9
Other activities	800	8
All other activities	600	6
Total	10,200	100

1/ Items do not add to total because of rounding.

National Science Foundation, Scientific and Technical Personnel in American Industry, 1960, p. 33.

search and development (table 12). 4/ Chemists made up the largest group of scientists engaged in research and development in the food and kindred products

industry. About 20 percent of the technicians working in this industry were engaged in research and development activities.

Expenditures for Research

The food and kindred products manufacturing industry spent about \$80 million in 1958 for research and development; in 1953 about \$54 million was spent for these activities. 5/ Company-financed research and development expenditures amounted to around 0.3 percent of net sales in 1957. 6/

In 1957 the food and kindred products manufacturing industry reported an average annual research and development cost per scientist, including engineers, of \$20,200; in 1953 this average was \$15,000. 7/ These estimates include salaries, cost of materials and equipment, and all other direct and supporting costs, plus a portion of overhead items such as administration, depreciation, and space charges. Wages and salaries of research and development

personnel made up about 62 percent of this total. 8/

The share of total research and development costs attributed to direct labor depends greatly upon the character of research and development done. In some research projects, salaries of the principal investigator and assistants comprise the main costs of the project, but salaries make up a smaller proportion of the total cost in research and development projects that require the use of expensive materials and equipment in the construction and testing of models or prototypes. The food and kindred products industry was among the industries with the highest percentage of total research and development costs allocated to wages and salaries. 9/

4/ Research and development include "basic and applied research in the natural sciences (including medicine) and engineering and design and development of prototypes and processes." The definition does not include "quality control, routine product testing, market research, sales promotion, sales service, or other non-technical activities, or technical services. If the primary objective is to make further improvements on the product or process, then the work is research-development. If on the other hand, the product or process is substantially 'set', and the primary objective is to develop markets, do preproduction planning or get the production process going smoothly, then the work is no longer research-development." Included are "all supervisors who spend more time on actual research-development work than on administration of research-development." National Science Foundation, Scientific and Technical Personnel in American Industry, 1960, p. 61.

5/ National Science Foundation, "Reviews of Data on Research and Development," May 1960, pp. 3-5, and Science and Engineering in American Industry, 1959, p. 8.

6/ National Science Foundation, Funds for Research and Development in Industry, 1957, 1960, p. 89.

7/ National Science Foundation, Science and Engineering in American Industry, 1956, pp. 32-34; Funds for Research and Development in Industry, 1957, 1960, p. 84.

8/ National Science Foundation, Funds for Research and Development in Industry, 1957, 1960, p. 86.

9/ National Science Foundation, Funds for Research and Development in Industry, 1960, p. 22.

Companies Employing Scientific Workers

Approximately 7 percent of all food processing companies hired scientists and technicians in 1959. Employment of these workers was directly correlated with size of the company; more larger companies than smaller ones hired them. Among companies with 5,000 or more employees, almost 97 percent hired scientific employees; among companies employing fewer than 100 persons about 4 percent hired scientists and engineers (table 13).

Scientists are among the highest paid

nonproduction workers. Although their salaries are relatively high, accomplishments of these workers have provided new and improved products. Many advances in the technology of food manufacturing, however, may be attributed to scientific workers employed by other industries serving the food processing industries. To compete effectively, firms manufacturing food and kindred products probably will increase their efforts to develop new products and reduce costs; this could mean even greater use of scientific workers in the years ahead.

Table 13.--Percentage of companies in food and kindred products industry employing scientists and technicians, by employee size, 1959

Company classification	Scientists and engineers		Technicians
	Percent	Percent	
Companies with total employment of:			
1 - 99	3.8	3.4	
100 - 499	22.5	17.5	
500 - 999	58.8	52.9	
1,000 - 4,999	79.1	64.3	
5,000 or more	96.9	96.9	
All companies	7.2	6.1	

National Science Foundation, Scientific and Technical Personnel in American Industry, 1960, pp. 27, '41.

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